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ABSTRACT

This is a basic weather course describing Florida's weather and is designed to give the student the opportunity to study the phenomena which cause the more destructive disturbances in the atmosphere. The study includes the detection, growth, effects and possible alternation of storms. It is suggested that a student enrolled in this course would have completed a course in applied meteorology or on the atmosphere in order to avoid extra time spent on elementary concepts. State-adopted texts are listed as well as student textbooks and laboratory manuals and suggested teacher references. Sixteen performance objectives are suggested. The course outline presents thirteen major topics: (1) Physical Factors of the Lower Atmosphere; (2) Influence of Upper Atmospheric Conditions; (3) Synoptic Charts; (4) Air Masses; (5) Contact Between Air Masses; (6) Rainstorms; (7) Droughts; (8) Hail; (9) Thunder Storms; (10) Hurricanes; (11) Tornadoes; (12) Modification of Weather Conditions; and (13) Storms Which Do Not Affect Florida. Student- and teacher-directed experiments are suggested. Projects and reports are included, as well as discussion questions. A reference list of suggested books, manuals, government publications, and films is presented along with a master plan sheet. (Author/EB)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE **QUINMESTER PROGRAM**

DADE COUNTY PUBLIC SCHOOLS

VIOLENT FLORIDA WEATHER

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SCIENCE

(Experimental) ²

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VIOLENT FLORIDA WEATHER

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SCIENCE

(Experimental)

Written by J. A. Espy, Jr.
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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VIOLENT FLORIDA WEATHER

COURSE DESCRIPTION

"Violent Florida Weather" is a basic weather course designed to give the student the opportunity to study the phenomena which cause the more destructive disturbances in the atmosphere. The study will include the detection, growth, effects and possible alteration of storms.

ENROLLMENT GUIDELINES

This course should be offered during the Spring, Summer and Fall quinnesters. The possibility of the student being able to study current violent weather conditions is greatest at this time.

The student should have completed "Applied Meteorology" or "Atmosphere" in order that time spent on elementary concepts is kept to a minimum. However, this is not a requirement. The "C" student with an interest in meteorology should be encouraged to take this course. The use of weather instruments would make the exclusion of those students that have manifested undesirable laboratory and classroom behavior a necessity.

STATE ADOPTED TEXTS

Brandwein, Paul F., et al. Matter Its Forms and Changes. New York: Harcourt, Brace and World, 1968.

Brown, F. Martin, et al. Earth Science. Morristown, N.J.: Silver Burdett, 1970.

Earth Science Curriculum Project. Investigating the Earth. Boston: Houghton, Mifflin Co., 1967.

Hibbs and Eiss. Earth-Space Sciences. River Forest, Ill.: Laidlaw Brothers, 1971.

Oxenhorn, J. Pathways in Science, Earth Science 1, 2, 3. New York: Globe Book Co., 1969.

Thurber, Kilburn, and Seager. Exploring Earth Science. Boston: Allyn and Bacon, 1970.

Students' textbooks and laboratory manuals should include #14 and #26 from those listed under References if possible. The books necessary for the violent weather discussions are #3, #4, #6, #18 and #19. The teacher may find #11, #22 and #23 helpful in the instruction of this course.

PERFORMANCE OBJECTIVES

Students will be able to:

1. Operate and gather data from the basic weather station instruments.
2. Compute the dry and saturated adiabatic lapse rate.
3. Cite evidence for the modification of lower weather conditions by atmospheric conditions.
4. Identify the symbols used on a weather map.
5. Discover the possible relationship between temperature and barometric pressure.
6. Predict possible weather conditions for a 24 hour period using a weather map.
7. Plot a graph of temperature and barometric pressure for a 24-hour period.
8. Compare upper and lower atmospheric conditions and propose reasons why they are different.
9. Recognize air masses as to their origin and relate them to local weather conditions which they effect.
10. Differentiate between the weather conditions produced by the different kinds of fronts.
11. Relate weather conditions with the possible types of storms which may be produced.
12. Using weather maps and reports, predict the possible path of a hurricane.
13. Propose and defend reasons why hurricanes do not occur in the southern hemisphere of the Atlantic Ocean.
14. Discuss critically weather modification.
15. Describe the general paths of storms in Florida.
16. Describe the destructive actions of the storms studied.

COURSE OUTLINE

- I. Physical Factors of the Lower Atmosphere
 - A. Pressure
 - B. Wind direction and speed
 - C. Precipitation
 - D. Types of clouds and coverage
 - E. Humidity
 - F. Temperature
 - G. Convection currents
 - 1. Saturated adiabatic lapse rates
 - 2. Dry adiabatic lapse rates
 - H. Review of instrumentation and measurement
- II. Influence of Upper Atmospheric Conditions
 - A. Jet stream
 - B. Effects on lower levels
- III. Synoptic Charts
 - A. Weather maps
 - B. Isobars
 - C. Isotherms
 - D. Upper atmospheric conditions
- IV. Air Masses
 - A. Places of origin
 - 1. Polar maritime
 - 2. Polar continental
 - 3. Tropical maritime (Caribbean Low)
 - 4. Tropical continental

- B. Pressure
 - 1. Cyclone
 - 2. Anticyclone
- V. Contact Between Air Masses
 - A. Frontal activity - normal
 - B. Storm production
- VI. The Rainstorm
 - A. Conditions necessary for a rainstorm
 - B. Rainstorm records
- VII. Droughts
 - A. Conditions necessary for droughts
 - B. Effects in South Florida
- VIII. Hail
 - A. Conditions necessary for hail
 - B. Frequency in Florida
 - C. Damage caused in Florida
- IX. Thunder Storms
 - A. Electrical nature of matter
 - B. Conditions necessary for thunderstorms
 - C. Danger and damages
 - D. Protective measures
- X. Hurricanes
 - A. Physical characteristics
 - B. Atmospheric conditions necessary for formation
 - C. Destructive forces
 - D. Protective measures

XI. Tornadoes

- A. Physical characteristics
- B. Atmospheric conditions necessary for tornadoes
- C. General paths of tornadoes
- D. Frequency and destruction in Florida
- E. Tornadoes formed over water

XII. Modification of Weather Conditions

- A. Atomic bomb
- B. Cloud seeding
- C. Others

XIII. Storms Which Do Not Affect Florida

- A. Blizzards and snowstorms
- B. Sleet and ice storms

EXPERIMENTS

Earth Science Curriculum Committee. Investigating the Earth. Boston: Houghton Mifflin Co., 1967.

1. Investigating Radiant Energy (p. 199, 7-1)
2. Investigating Land and Water Temperatures (p. 209, 7-2)
3. Investigating the Weather - Weather Watch (p. 232, 8-9)
4. Investigating Cumulus Cloud Formation (p. 242, 8-12)

Navarra and Strahler. Our Planet in Space: The Earth Science, InvestiGuide. New York: Harper and Row, Publishers, 1969.

5. Energy Exchanges by Atmospheric Circulation (p. 137, I-11)
6. Exchanges of Heat Energy on Land and Sea (p. 155, I-12)
7. Energy Exchanges through Atmosphere Moisture (p. 167, I-13)

Thurber, Kilburn, Seager. Exploring Earth Science. Boston: Allyn and Bacon, 1970.

8. The Atmosphere (p. 123)
9. Weather and Its Cause (p. 133)

Wolfe and Others. Earth and Space Science - Laboratory Manual. Boston: D. C. Heath and Co., 1966.

10. Measuring Air Temperature (p. 139, E-40)
11. Measuring Humidity with a Sling Psychrometer (p. 143, E-41)
12. Measuring Dew-Point Temperature (p. 147, E-42)
13. Measuring Atmospheric Pressure (p. 149, E-43)
14. Conduction, Convection and Radiation of Heat (p. 151, E-44)
15. Cloud Droplets (p. 155, E-46)
16. Vertical Structure of Lower Atmosphere (p. 163, E-48)
17. Structure of the Earth's Atmosphere (p. 165, E-49)
18. Atmospheric Pressure and Winds (p. 167, E-50)
19. Drawing a Weather Map (p. 171, E-51)
20. Sizes of Cloud Droplets and Raindrops (p. 177, E-53)

Teacher directed experiments.

21. Plotting the paths of tornadoes and hurricanes (past or simulated)
22. Forecast the weather for any city using the data presented on a weather map
23. Plotting the daily variations in temperature and atmosphere pressure

PROJECTS

1. Construct a wind producing device and demonstrate the effect of wind on different surfaces and shapes.
2. Cloud formations - pictorial account and analysis of cloud types during different weather conditions.
3. Cloud formations - pictorial account and analysis of cloud types associated with frontal weather.
4. Analysis of weather for an area during a two week period using the daily weather maps from the Weather Bureau and newspapers.
5. Construct and maintain a home weather station.
6. Construct a hurricane producing model and demonstrate the elements which could produce a hurricane.

REPORTS

1. Comparison of frontal weather and the tendency of fronts to produce violent weather during the four seasons.
2. Tornadoes in Florida: Their paths and property destruction.
3. The effect of seeding as a method of weather modification.
4. A critical analysis of property and life losses from hurricanes and/or tornadoes during the past ten years.
5. The value of our modern hurricane detection machinery.
6. The production and destructiveness of waves by hurricanes.
7. Lightning: Its cause and effects.
8. Hail: Its cause and effects.
9. Typhoons: A comparison with hurricanes.
10. The use of weather satellites in the detection and study of storms.
11. Violent storms in other parts of the world.

DADE COUNTY 16mm FILMS

	Title	Producer	Time	Number
1.	<u>Clouds</u>	Almanac Films	10', BW	1-02129
2.	<u>Clouds Above</u>	Bailey Films	9', C	1-02135
3.	<u>Earth, The: Its Atmosphere</u>	Coronet	11', C	1-02124
4.	<u>Eyes in Outer Space</u>	Walt Disney	27', C	1-30386
5.	<u>How Weather Is Forecast</u>	Coronet	10', BW	1-02080
6.	<u>Hurricane Circuit</u>	U W	23', BW	1-10991
7.	<u>Inconstant Air, The</u>	McGraw Hill	29', C	1-30373
8.	<u>Modern Weather: Theory and Structure of Storms: Development and Characteristics of Atmospheric Waves</u>	U W	15', BW	1-12986
9.	<u>Modern Weather: Theory and Structure of Storms: Primary Circulation</u>	U S Sig Corp	18', BW	1-13110
10.	<u>Origin of Weather</u>	Carousel	26', BW	1-30376
11.	<u>Origins of Weather</u>	NFB - Canada	13', C	1-10994
12.	<u>Reading Weather Maps</u>	Coronet	14', BW	1-10995
13.	<u>Story Behind Hurricanes, The</u>	Pathe	6', BW	1-02100
14.	<u>U P In the Air: Exploring our Atmosphere</u>	Grov-Jenn	12', C	1-04463
15.	<u>Weather: Air in Action (Temperature and Wind)</u>	Cahill	8', C	1-02112
16.	<u>Weather Research (The Search)</u>	McGraw	27', BW	1-30380
17.	<u>Weather Station, The</u>	McGraw	11', BW	1-02119
18.	<u>Weather: Understanding Storms</u>	Coronet	10', BW	1-02128

	Title	Producer	Time	Number
19.	<u>What Makes Clouds</u>	EBEC	19', C	1-11002
20.	<u>What Makes the Wind Blow</u>	EBEC	16', C	1-10997
21.	<u>Winds and Their Causes</u>	Coronet	10', BW	1-02113

TRANSPARENCIES

The following transparencies can be obtained from the Dade County Audiovisual Center.

1.	<u>Earth Science: Meteorology Set 1</u>	Hubbard Sci.	2-30149
2.	<u>Meteorology</u>	A. V. Center	2-30025
3.	<u>Weather: Cloud Formation</u>	Drago	2-00219
4.	<u>Weather, The: Clouds</u>	Toslen	2-30161
5.	<u>Weather, The: Front Formations</u>	Toslen	2-30162
6.	<u>Winds, Currents and Explorations</u>	EBEC	2-30116

SLIDES

Available from Dade County Audiovisual Center.

1.	<u>Clouds and Weather</u>	5-70019
2.	<u>Clouds, Lightning and Rainbows</u>	5-30003

DISCUSSION QUESTIONS

1. Why do hurricanes not form in the southern hemisphere of the Atlantic Ocean?
2. Why has Miami missed the hurricanes' full force during the past five years?
3. Why are weather maps important?
4. Why are high level atmosphere conditions important to a complete understanding of weather?
5. Do our local weather conditions prevent tornadoes rather than cause them?
6. Will man be able to completely modify weather to suit his needs?
7. Why are weather reports important in projecting storms' paths?
8. Is Florida really hurricane prone?
9. Are the property and life losses from violent weather in Florida any greater than other states on the Gulf and Eastern coasts?
10. Is there any relationship between the heat at the equator and violent storms?

REFERENCES

Books and Laboratory Manuals

1. American Geological Institute. Geology and Earth Science Sourcebook. New York: Holt, Rinehart, and Winston, Inc., 1962.
2. Brandwein, Paul and others. The Earth: Its Changing Form. New York: Harcourt, Brace and World, Inc., 1970.
3. Batten, L. The Thunderstorm. New York: New American Library, 1964.
4. Batten, L. The Nature of Violent Storms. Garden City, New York: Doubleday Anchor, 1961.
5. Day, John. The Science of Weather. New York: Addison and Wesley Publishing Co., 1966.
6. Dunn, G. and Banner. Atlantic Hurricanes. Baton Rouge: Louisiana State University Press, 1964.
7. Earth Science Curriculum Project. Investigating the Earth. Boston: Houghton Mifflin Co., 1967.
8. Forsdyke, A. G. Weather and Weather Forecasting. New York: Grosset and Dunlap, 1970.
9. Hibbs and Eiss. Earth - Space Sciences. River Forest, Illinois: Laidlaw Brothers, 1971.
10. Iger, Eve. Weather on the Move. New York: Young Scott Books, 1967.
11. Knight, David. Meteorology. New York: Franklin Watts, 1964.
12. Laird, Charles and Laird, Ruth. Weathercasting. Englewood Cliffs, New Jersey: Prentice Hall Inc., 1966.
13. Lehr, Paul. Weather. New York: Golden Press, Inc., 1957.
14. Namowitz and Stone. Earth Science. Princeton, New Jersey: D. Van Nostrand Company, Inc., 1965.
15. Oxenhorn, J. Pathways in Science, Earth Science 1, 2, 3. New York: Globe Book Co., 1969.
16. Ross, Frank. Weather. New York: Lathrop, Lee and Shepart Inc., 1965.
17. Scorer, Richard. Cloud Studies in Colour. Elmsford, N.Y.: Pergamon Press, 1967.

18. Sloane, Eric. The Book of Storms. New York: Duel, Sloan and Pierce, 1956.
19. Snowden, F. Tornadoes of the United States. Stillwater: University of Oklahoma Press, 1964.
20. Spar, Jerome. The Way of Weather. New York: Creative Educational Society Inc., 1964.
21. Spilhaus, Athelstan. Weathercraft. New York: Viking Press, 1964.
22. Sutton, O. G. The Challenge of the Atmosphere. New York: Harper and Brothers, 1961.
23. Taylor, G. Elementary Meteorology. Englewood Cliffs, New Jersey: Prentice Hall Inc., 1954.
24. Thompson, Obrien, and the Editors of Life. Weather. New York: Time Inc., 1965.
25. Thurber, Kilburn and Seager. Exploring Earth Science. Boston: Allyn and Bacon, 1970.
26. Wolfe, Fleming, Skornik and Stubbs. Earth and Space Science. Boston: D. C. Heath and Company, 1966.
27. Zim, H. Weather. New York: Golden Press, 1957.

United States Government Publications

28. Daily Weather Maps - Superintendent of Documents, Washington: U. S. Government Printing Office.
29. U. S. Weather Bureau. An Annotated Meteorological Bibliography for Secondary School. Washington: U. S. Government Printing Office, 16 p. 10, 1960.
30. Manuals of Cloud Forms and Codes for States of Sky. Washington: U. S. Government Printing Office, 1949.
31. Weather Forecasting. Washington: U. S. Government Printing Office, 1949.
32. Preliminary Report on Tornadoes. Washington: U. S. Government Printing Office, 1955.
33. Report of Thunderstorms Project. Washington: U. S. Government Printing Office, 1949.

MASTER SHEET--VIOLENT WEATHER

Objectives	Experiments	Student Text	Supplementary References	Film	Transparencies	Slides
1	2,9,10,11,12,13,14,15	#2, chap. 6,14 #26, ch. 27	5,8,13,17,20,27	5,21	1,2,6	1,2
2	16,17	#14, chap. 34	8,11,23,27	23		
3		#14, chap. 35 #26, chap. 28	#1, pp. 257 8,11,13,27	3,7,24,25		
4	3,8,4G	#14, chap. 32 #26, chap. 29	8,12,27	12		
5	8,9	#14, chap. 32 #26, chap. 29	5,11,23	7		
6	2,9,18	#14, chap. 29 #26, chap. 29	5,8,11,16,21,27	5		
7	23					
8		#14, chap. 32 #26, chap. 28	8,11,23	18		
9	9	#14, chap. 36 #26, chap. 29	8,12,21,27	10,11		
10		#14, chap. 37 #26, chap. 29	3,8,11,17,20,27	8,9	3,5	1,2
11		#14, chap. 36 chap. 37 #26, chap. 30	4,6,8,10,18,23,27	8,9		
12	22	#14, chap. 36 chap. 37 #26, chap. 30	4,6,8,10,18	6,17		
13		#14, chap. 37 #26, chap. 30	4,6,8,10,18	6,8,9,17,22		
14		#14, chap. 35 #26, chap. 30	3,4,6,10,18,19, 20,23			
15	23	#14, chap. 37 #26, chap. 30	3,4,6,10,11,18,19, 20	8,9,17,20,22		
16		#14, chap. 37 #26, chap. 29	3,4,6,8,10,18,19, 20,23	8,9,17,20,22		